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Interagency Intelligence Memorandum

Soviet Approaches to Defense Against Ballistic Missile Submarines and Prospects for Success

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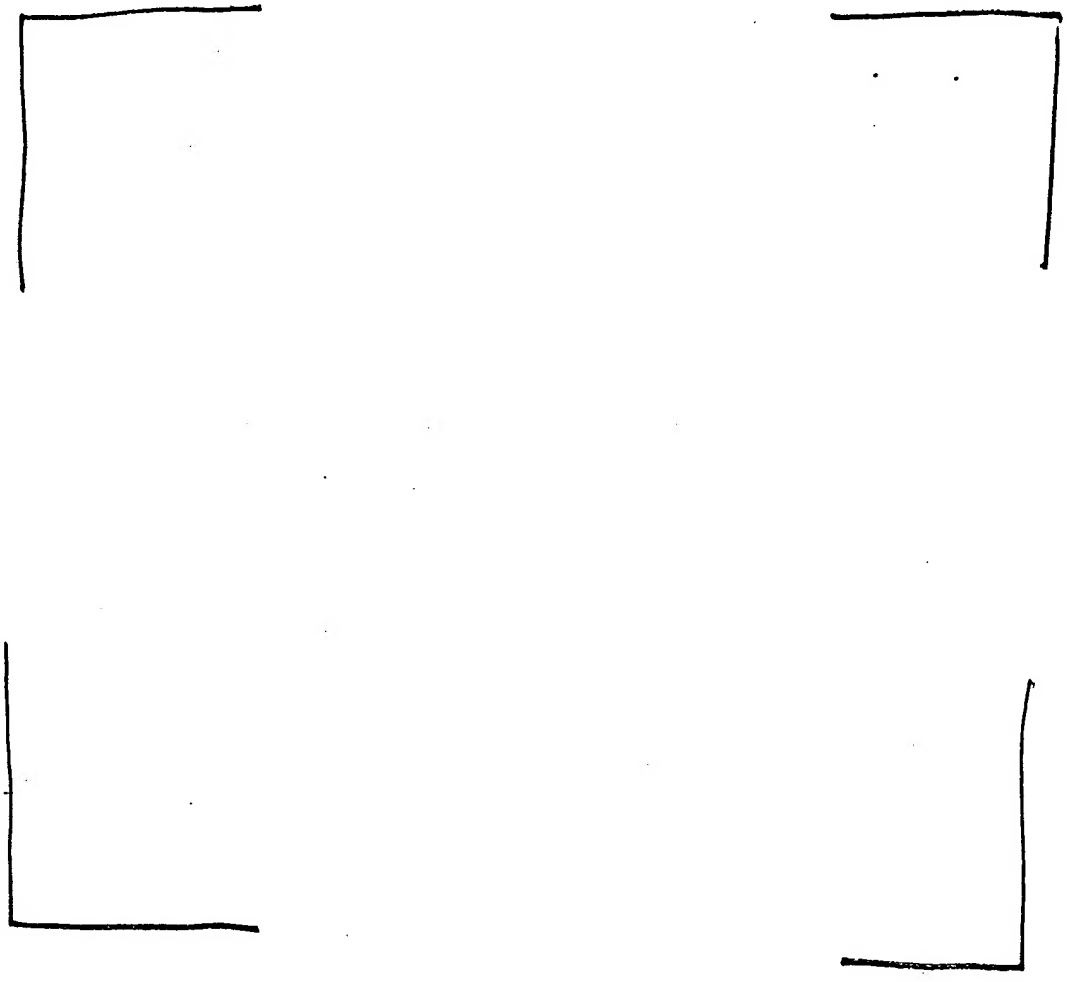

SOVIET APPROACHES TO DEFENCE AGAINST BALLISTIC MISSILE SUBMARINES AND PROSPECTS FOR SUCCESS

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PREFACE

This Interagency Intelligence Memorandum was prepared at the request of the National Intelligence Officer for Strategic Programs and is intended to convey to policymakers in nontechnical language the possible Soviet approaches to destroying ballistic missile submarines at sea as a means of defending against the threat of submarine-launched ballistic missiles. It was prepared by the Defense Intelligence Agency in collaboration with the Central Intelligence Agency, the National Security Agency, the Bureau of Intelligence and Research, Department of State, the Office of the Assistant Chief of Staff for Intelligence, Department of the Army, the Director of Naval Intelligence, Department of the Navy, and the Assistant Chief of Staff, Intelligence, Department of the Air Force.

The report covers current and future Soviet strategy and capabilities to degrade the effectiveness of the Western ballistic missile submarine force at sea now and over the next ten years. An annex discusses the application of technological developments to future antisubmarine warfare systems. It updates and expands on the November 1974 Interagency Intelligence Report "Prospects for Success in Improving Detection of Submarines in Open Ocean Areas."

This Interagency Intelligence Memorandum was prepared as backup for NIE 11-3/8-75, "Soviet Forces for Intercontinental Conflict Through the Mid-1980s." While the memorandum was not in finished form, its general findings were available at the time NIE 11-3/8-75 was completed. The conclusions in NIE 11-3/8-75 reflect the conclusions of this memorandum. The cut-off date for information in this report was 1 March 1976.

SUMMARY

Our principal conclusions about Soviet defenses against Western ballistic missile submarines (SSBNs), which have varying degrees of uncertainty, are as follows:

—*Soviet antisubmarine warfare forces do not now constitute a serious threat to Western SSBNs at sea. Soviet forces have major deficiencies in their ability to detect and track SSBNs.*

—*It is probable that future improvements in Soviet defenses will place Western SSBNs in greater risk of detection and destruction in restricted waters and possibly in some of their current operating areas.*

—*It is unlikely that during the next ten years the research and development programs which the Soviets have underway will result in operational antisubmarine warfare (ASW) forces capable of threatening the prelaunch survivability of the US ballistic missile submarine force programed to be at sea at any time.*

The only practical counter to SSBNs is to destroy them at sea before they launch their missiles, particularly in the absence of anti-ballistic missile defenses. To do so would require some combination of aircraft, ships and submarines, sensor systems and weapons capable of detection and localization within a very short period, and near-simultaneous destruction of all ballistic missile submarines at sea. Of the three fundamental tasks in antisubmarine operations—detection, localization and destruction—detection is the contingent element in current and future Soviet defenses against SSBNs. Detection of all SSBNs at sea would require either a broad ocean area submarine surveillance system or a capability to track SSBNs for extended periods, possibly by covert trail.

We are confident that the Soviets do not now have the capability to determine the location of Western SSBNs at sea with the precision necessary to attack them, or the capability to track them for extended periods. The extent to which these deficiencies are removed in the future depends on the success of their various research programs aimed at development of improved sensors for submarine detection and tracking.

The Soviets have research and development programs to support operational ASW requirements:

—in oceanography, including oceanic microstructure, turbulence, and short-term variability of the ocean medium;

—in the technologies known in the West to have potential application to ASW sensors, including hydroacoustics, extremely low frequency (ELF) electromagnetics, optical technology, infrared (IR) imagery, and magnetometry; and

—in signal processing theory and techniques for ASW application, although the Soviets probably lack the capability to produce quantities of sophisticated high-quality integrated circuits for operational signal processing hardware.

Our assessment of prospects for Soviet development of improved systems for submarine detection and tracking is based mainly on assessments of the Soviet research and development programs in the following technologies:

—acoustic sensors including advanced arrays,

—wake detection,

—detection of ELF emissions from submarines,

[redacted]

—laser research with ASW potential, and

—submarine quieting.

From our understanding of the technologies involved and of research and development programs in the US and the USSR, we conclude that the Soviets have little potential for achieving effective operational systems for wide-area ocean surveillance or long-term covert trail of ballistic missile submarines in the next ten years. Moreover, improvements in US SSBNs and expansion of their operating areas will compound the Soviet problem of finding and tracking them. These judgments are qualified by gaps in our knowledge of [redacted] possible future Soviet developments.

Although it is our present judgment that in the next ten years Soviet ASW capabilities will fall short of being able to prevent most US submarines on station from launching their missiles, the extensive Soviet ASW research and development activities merit close observation in the years ahead.

I. INTRODUCTION

1. The US ballistic missile submarine was developed to increase the survivability of US intercontinental attack forces. For the Soviets to limit damage to the USSR from a US nuclear strike, they must achieve a capability to destroy US SSBNs, bombers and ICBMs. To do so they must acquire a rapid and near-certain means for finding and destroying submarine-launched ballistic missiles.[1] In general, there are three approaches to defense against SLBMs that Soviet military planners have explored:

—disruption of the submarine command and control network so that SLBM launch orders cannot be received;

—interception of SLBMs or their reentry vehicles in flight with antiballistic missiles (ABMs); and

—destruction of the SSBNs before they can launch their missiles.

2. Approaches that involve disruption of the command and control network and ABM defenses are outside the scope of this study. Temporary disruption of the command network is at best a delaying measure because the submarine remains fully operational and the missiles remain a threat. An effective SLBM defense based on missile intercept is foreclosed as long as the ABM Treaty remains effective. Thus, the basic Soviet problem is to develop a reliable means of detecting and destroying the SSBN force prior to the launch of its missiles. If the Soviets were to attack without warning, about half of the SSBNs would normally be at shore facilities and would be vulnerable, but such an attack would not eliminate the threat posed by the SSBNs already at sea. Therefore, the key to an effective defense against SLBMs lies in the destruction of ballistic missile submarines at sea.

Anti-SSBN Warfare

3. Antisubmarine warfare conducted against ballistic missile submarines involves considerations that are fundamentally different from those encountered in ASW against attack submarines. In combating attack submarines, some loss of friendly forces and the survival of some enemy submarines is tolerable and expected. The effectiveness of anti-SSBN warfare, on the other hand, is much more critical because of the destructive capability of just one surviving SSBN. Moreover, there are stringent time constraints on anti-SSBN operations. To minimize damage to the USSR following a Soviet preemptive attack, the Soviets would have to conduct *a coordinated nearly simultaneous strike against all SSBNs* within missile range of the Soviet Union in conjunction with strikes against ICBMs and bombers.

Coordinated Strike

4. Conceptually there are three requirements for a coordinated strike. The first and most formidable requirement is to know the location of those SSBNs at sea at the time of the strike. There appear to be two general ways that this first requirement might be satisfied:

—deployment of a broad-area ocean surveillance system, fixed or mobile, which could provide essentially real-time information on the approximate location of all SSBNs; or

—deployment of a multiplicity of reconnaissance systems which could locate, over a period of time, all SSBNs and track them continuously until the time of attack.

The second requirement for a coordinated strike is to have a capability for localization of all SSBNs in order

[1] For a fuller discussion of Soviet strategic programs and capabilities, see NIE 11-3/8-75: "Soviet Forces for Intercontinental Conflict Through the Mid-1980s," 17 November 1975.

to deliver weapons against them. (Detection may also provide localization of the SSBN, depending on the accuracy of the detection system.) The third requirement, near-simultaneous destruction of SSBNs at sea, would necessitate having weapons, sensors, tactics, and command and control systems capable of supporting such an effort. The absence of capabilities for detection, localization, and destruction of all SSBNs at sea in a coordinated strike need not preclude a limited form of coordinated strike on those SSBNs that had been detected and localized.

Campaign of Attrition

5. Alternatively, an ASW force might be used to conduct a campaign of attrition against SSBNs. Gradual destruction of the SSBN force, however, would allow the other side to respond before the force had been neutralized. On the other hand, a strategy of attrition is the only one that could be supported by current and likely future Soviet ASW forces. Moreover, destruction of submarines one by one might be regarded as less likely than a coordinated strike to stimulate a massive nuclear exchange.

II. THE PRESENT SOVIET APPROACH AND CAPABILITIES FOR COUNTERING SSBNs

Soviet Perceptions of the SSBN Problem

6. According to Soviet writings, a primary objective of Soviet ASW is to thwart an attack by Western SSBNs. In case this objective seems unattainable when action is required, the Soviets intend to weaken to the maximum extent possible an attack by those forces. Soviet writings also provide insights into some Soviet perceptions of the anti-SSBN problem.

Size of the Enemy Force

7. In calculating the size of the Western SSBN force, the Soviets do not discriminate among SSBNs of the US, the UK, and France, who have a total of 48 SSBNs with 768 missile launchers. Under normal peacetime conditions, the Soviets expect about 50 percent of the force to be at sea at any one time. One source, in 1968, indicated that in a crisis the Soviets expected about 90 percent to be at sea. In planning their force structure the Soviets might have to consider attacking both SSBNs and nuclear-powered attack submarines, depending on how they assess their ability to differentiate between the two types.

Location and Extent of Operational Areas

8. The Soviets probably base their estimates of the extent and location of Western SSBN patrol areas on a variety of information including weapons characteristics, targets, geographic considerations, environmental conditions, and operational doctrine. Various sources indicate the Soviets have concluded that all Western SSBNs can launch missiles from any point in the ocean that is within missile range of the target, and that Western SSBNs are not currently operating in the Indian or Arctic Oceans. Hence, they conclude that Western SSBNs normally operate in the Norwegian Sea, northeastern Atlantic, Mediterranean Sea, and western Pacific.

Required Timeliness of Action

9. Soviet doctrine and force posture indicate the Soviets assume that a period of tension would precede a nuclear attack on the USSR. [redacted] Soviet planners believe they would have a period of about ten days before the beginning of hostilities to increase their preparedness and to locate enemy SSBNs. The Soviets have concluded that a Western SSBN requires about 30 minutes to complete missile launch following the receipt of the launch message. This is based on the estimate that about 15 minutes would be required for the final preparations to fire and that once launching begins, all missiles would be launched within 15 minutes.

Strategy

10. The Soviets' perceptions of the SSBN problem and the limited effectiveness of their ASW forces are among the key determinants of their present strategy for defense against ballistic missile submarines. We believe the Soviets desire, but do not expect to conduct, a successful coordinated strike against all SSBNs. Prior to the outbreak of hostilities they would almost certainly attempt to track as many SSBNs as possible from their bases, from choke points, and from encounters in the open ocean. The ASW forces would attempt to maintain contact and withhold attack until ordered to strike. We believe Soviet strategy for the destruction of SSBNs at sea contemplates a simultaneous attack against those submarines that have been localized followed by a campaign of attrition.

11. The point in a conflict at which the Soviets would attempt to destroy SSBNs would depend on the

situation. Soviet military doctrine emphasizes attacks against enemy nuclear-capable forces including SSBNs in the opening stages of a major war. In such a war, this would include attacks against enemy SSBNs at sea and strikes against SSBN bases. In a theater war, confined to Europe and the surrounding oceans, the Soviets would, by their definition, refrain from attacking submarine bases in the US. There are indications, however, that Soviet theater war doctrine calls for attacks against SSBNs at sea at the onset of hostilities, whether conventional or nuclear. However, if the Soviets thought they could restrict the conflict to conventional warfare; they might refrain from attacking SSBNs in order to reduce the possibility of escalation. In a more limited war, the Soviets almost certainly would not attack enemy SSBNs, although they might increase their attempts to track them.

12. The Soviet Navy engages in operations and exercises which include those tactics appropriate to the implementation of the Soviet anti-SSBN strategy. These activities vary from many small exercises in local waters to a few Navy-wide operations in broad ocean areas in which large numbers of ASW units participate. Some of these operations almost certainly involve simulated and actual attempts to detect Western SSBNs. The experience derived from these operations and exercises is applicable to operations against either SSBNs or nuclear-powered attack submarines.

13. The Soviets emphasize in their ASW operations[2] and exercises those tactics which they believe offer the best opportunity for success. For example, they appreciate the advantages of operations in confined waters where ASW forces can be concentrated while SSBN maneuvering is restricted. Thus we believe the Soviets plan to concentrate on detecting Western SSBNs as they leave their bases and as they pass through straits. They are attempting to develop tracking and trailing capabilities—so far without demonstrated success—to maintain contact with Western SSBNs until the commencement of hostilities.[3]

Tactics for Obtaining Initial Detection

Base Surveillance Operations

14. In peacetime, surveillance of Western submarine bases, at a minimum, provides opportunities to collect some technical and operational data on SSBNs and to accumulate more realistic operational experience by operating against potential targets. It is common for Soviet naval intelligence collectors (AGIs) to be stationed off SSBN bases to monitor submarine arrivals, departures, and local operations. In recent years attack submarines, primarily of the Victor class, have operated for short periods off US SSBN overseas bases in conjunction with an AGI. We believe these activities are being conducted not only to collect intelligence, but as some Soviet sources have suggested to form the basis for initiating trail on SSBNs. It is relatively easy for the AGI to detect the surfaced SSBN visually or by the use of sensors. Once a detection is made, the AGI can direct an attack submarine to the vicinity of the SSBN. The Soviets might then attempt to intercept and trail the SSBN, but there is no evidence that they have so far succeeded in trailing a US SSBN.

15. In a crisis or when hostilities appear imminent, the surveillance AGI would be subject to harassment and blocking so that in all probability Soviet attack submarines would be forced to operate without assistance. Because of the limits of sensors aboard

[2] ASW operations consist of four phases—detection, classification, localization, and attack:

—*Detection* consists of sensing the presence of the submarine. Detection of a prudently operated submarine in the open ocean is difficult at best, barring a chance contact by nearby forces. Only the US, with its Sound Surveillance System (SOSUS), has a system which is capable of extremely long-range detection of high source level targets. Other countries rely primarily on patrol aircraft, surface forces and submarines.

—*Classification* establishes the contact as submarine or nonsubmarine, friendly or hostile, and perhaps the class of submarine. Classification may be achieved by comparing intercepted acoustic signals with discrete frequencies known to be associated with a particular class of submarine.

—*Localization* is the process of determining the submarine's position with sufficient accuracy for weapon delivery. Upon arrival in the contact area, ASW forces localize the submarine by searching with a combination of sensors.

—*Attack* is the phase in which the weapon is prepared and launched against the target. This phase begins once the target is within weapons acquisition and kill range.

[3] "Tracking" as used in this paper connotes knowing the location of a submarine on a near-continuous basis by any platform, sensor, or method. "Trailing" is a special form of tracking in which a submarine follows the target.

[redacted]

current Soviet submarines, unassisted initiation of trail of an evasive ballistic missile submarine is an unreliable method on which to base an anti-SSBN strategy.

Choke Point Operations

16. The Soviets frequently patrol in straits and other narrow passages in attempts to detect submarines in transit. During exercises the Soviets may deploy substantial numbers of forces to these areas. Areas where such tactics have been used include the Straits of Gibraltar and Sicily, the waters south of Sardinia, and the Greenland-Iceland-UK gap. The Soviets have used various platforms in constituting these barriers, from the Moskva antisubmarine helicopter carrier to escort ships and, on occasion, auxiliaries. Aircraft used have included both fixed-wing and shipborne helicopters.

17. Soviet barrier operations have involved both nuclear and diesel submarines. The latter, whose limitations in speed and endurance make them unsuitable for trailing operations, could be used in barriers to initially detect and destroy transiting SSBNs. In barrier applications, both surface ships and fixed-wing aircraft could also be used, but their effectiveness would depend to a major degree on the tactical situation (e.g., control of the air). As for fixed-wing aircraft, they could be employed either alone or in conjunction with other forces to detect and localize targets, assist in reacquisition if contact is lost, or to conduct attacks. While barrier force units would function better as a team, most have the ability to carry out each phase of ASW—from initial detection to attack—independently.

18. In addition to their potential use to detect and destroy SSBNs, barrier operations could be used to obtain the initial detection of transiting SSBNs proceeding to or from patrol for the purpose of initiating trail. The effectiveness of operations for this purpose would depend on many factors, including the number of platforms employed, capabilities of the various sensors available, and environmental conditions. The Soviets could theoretically cover the entire passage in narrow choke points such as the Straits of Gibraltar (21 nm). Coverage of the wider passages (such as the 400-nm gap between Iceland and the UK), however, would require much larger forces and would pose much more difficult problems. In evaluating the potential effectiveness of barrier operations as a defense against ballistic missile submarines, the Soviets would have to take into acccount:

—possible changes in SSBN patrol areas that would avoid barrier passage,

—likely commitments of Western air and/or naval forces to oppose Soviet barrier units, and

—the use of countermeasures by transiting SSBNs.

We believe that Soviet employment of barrier tactics, even under the most favorable conditions, would not result in detection of more than a few SSBNs as a means of initiating continuous tracking.

Patrol Area Search

19. Soviet surface ships and submarines operate regularly and Soviet ASW aircraft operate occasionally in some of the US SSBN operating areas. In recent years such Soviet operations have increased and some of them have been searches for SSBNs, usually characterized by intensive activity in relatively small areas of open ocean. In conducting these operations, the Soviets seem to prefer a coordinated effort by all three types of platforms, but individual units—especially aircraft and attack submarines—frequently operate independently.

20. We believe that the Soviets do not have a detection system which could give them even the general location of SSBNs on patrol.

On the basis of system limitations, such as SLBM range, the Soviets could reduce somewhat the potential search areas (see Figures 1 and 2). These areas are, however, greater than those which Soviet forces could currently search with a reasonable probability of detection within the time available to do so. We are uncertain of the means by which the Soviets select smaller areas for intensive ASW activity.

Figure 1

Ocean areas within Polaris/Poseidon range of Moscow and Khabarovsk

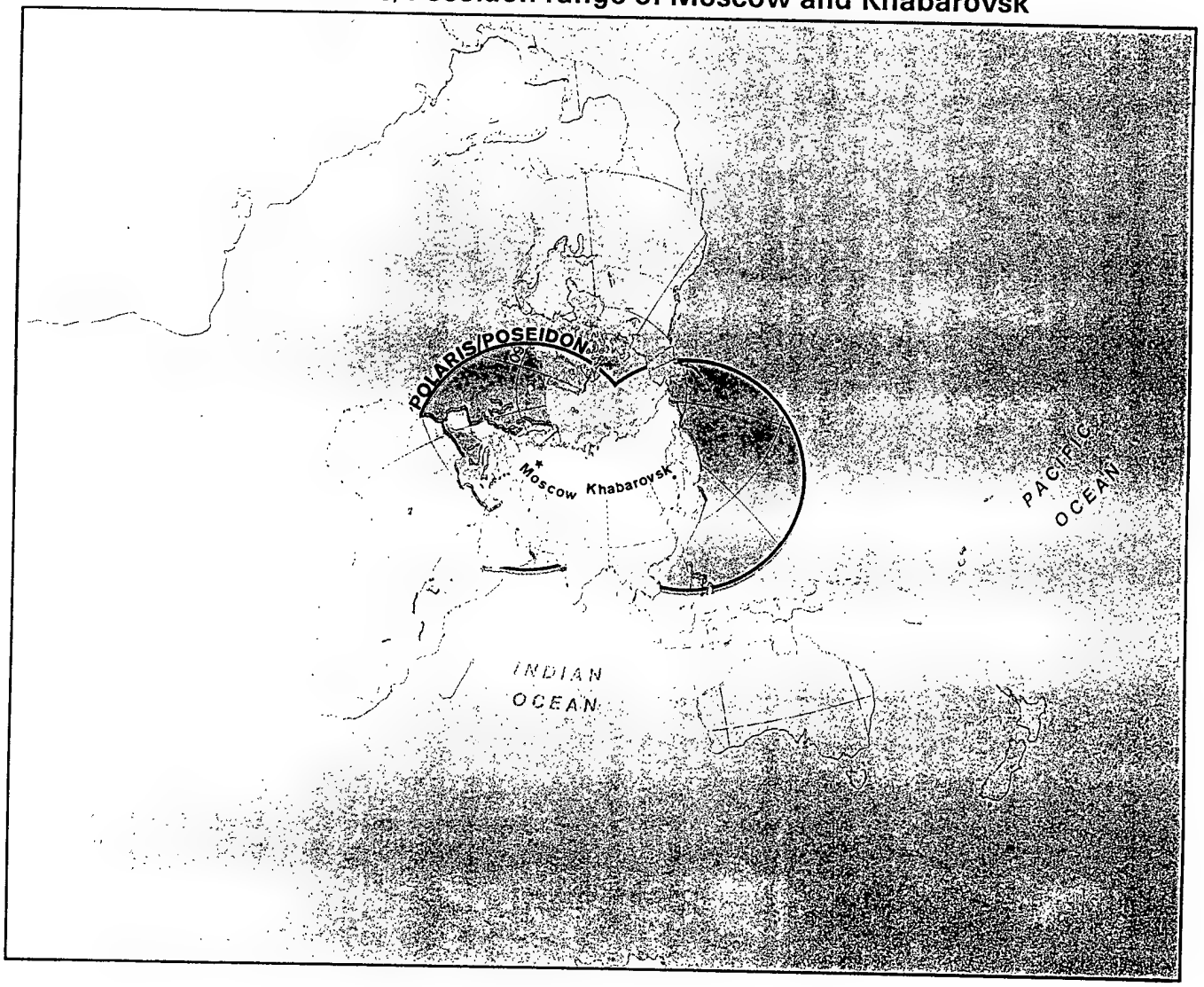

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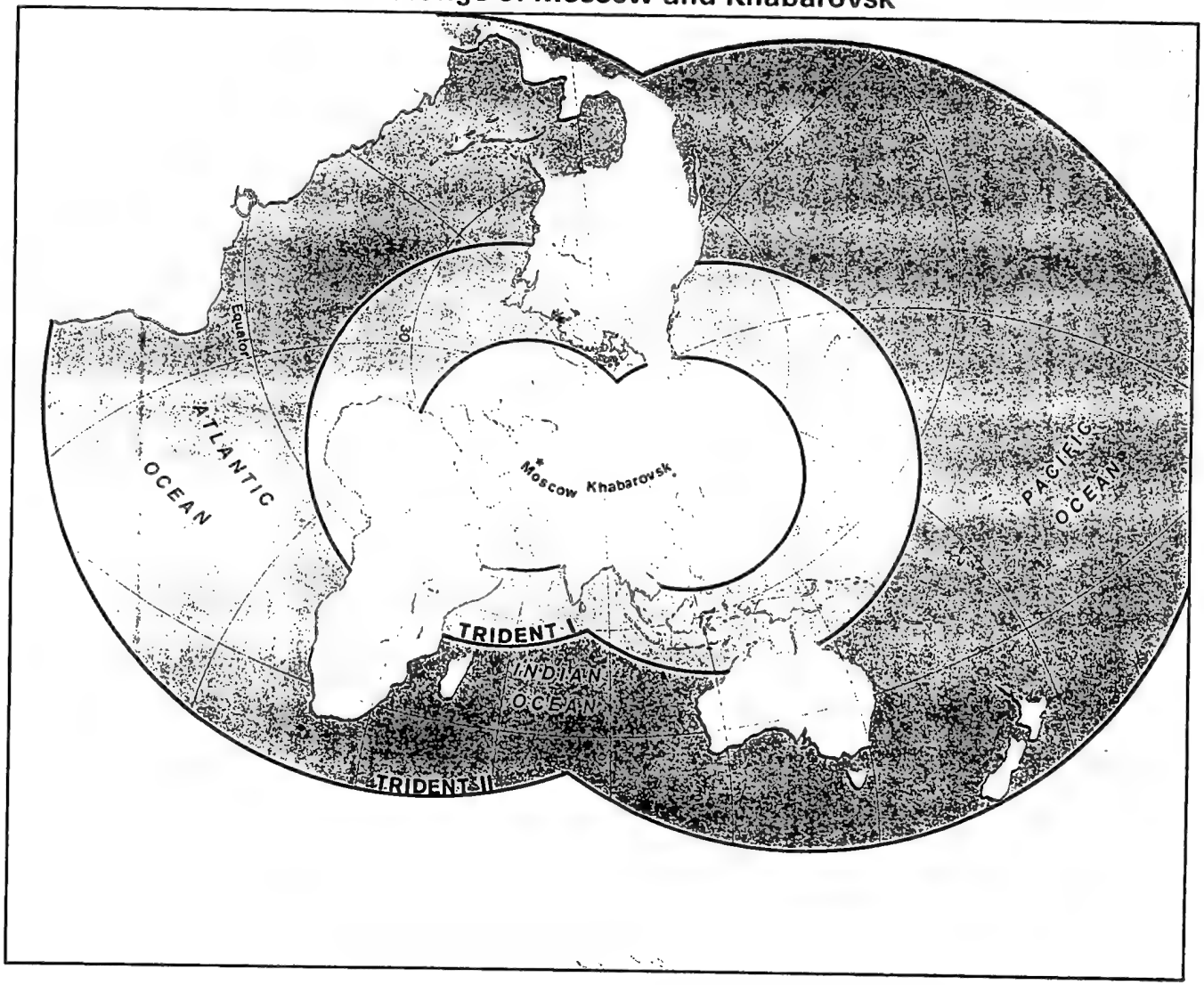
Figure 2

Ocean areas within Trident range of Moscow and Khabarovsk



Tactics for Maintaining Contact

Trailing

21. Once an SSBN was detected, the Soviets might try to track the submarine with surface ships and aircraft, but we believe that trailing would be their preferred tactic. In a period of crisis, the Soviets would probably attempt to establish trail on Western SSBNs partly through the use of attack submarines assisted by surface ships in the vicinity of bases. In both choke point and open ocean operations, surface or air units would direct the trailing submarine to the target.

22. Trailing may be overt or covert. In covert trailing, the target submarine, being unaware of the trailer's presence, is less likely to employ countertactics; the tactical initiative remains with the trailer. The most effective sensor for such trails currently is passive sonar. The high radiated noise levels of Soviet submarines and their poor passive sonar capability (compared to that of US SSBNs) makes it likely that the US submarine would detect the trailing Soviet submarine. Thus covert trail using passive sonar would be extremely difficult for the Soviets.

23. Instead of passive sonar capability and platform quieting, the Soviets have emphasized active sonar and attack submarines designed for speed. Soviet nuclear-powered attack submarines possess a significant speed advantage over Western SSBNs and are fitted with a variety of active acoustic sensors, including a short-range high-resolution sonar. These characteristics suggest that one consideration in Soviet submarine design is a capability for overt trail. The Soviets use the overt mode of trail in exercises under a variety of circumstances, including after loss of passive (covert) trail. Several potential countermeasures against overt trail are available, however, [redacted]

24. The Soviets thus do not currently have a significant trail capability, covert or overt. Their covert trail capability in particular is limited by the acoustic advantage held by US submarines [redacted]

Surface and Air Tracking

25. During a period prior to the outbreak of hostilities, surface ships and aircraft probably would also attempt to detect and then track SSBNs covertly or overtly until ordered to attack. The Soviets have stressed coordinated surface and air ASW operations, and have developed the tactics and communications systems to support such efforts. Recent Soviet ASW combatant construction and operations have emphasized shipborne ASW helicopters (see Figure 3). If a detection were made, a combination of Soviet air and surface platforms might be able to track an SSBN for a limited period. The success of such operations would depend, however, on factors which include the type and number of platforms and sensors employed, environmental conditions, and countermeasures available to the SSBN.

Target Classification and Attack

Capabilities for Classification

26. For effective use of ASW assets, the Soviets must discriminate among submarine types using a variety of sensors and techniques. We believe the Soviets are capable of differentiating between submarine and non-submarine contacts, and between Soviet and non-Soviet submarines. *We do not know if the Soviets can differentiate SSBNs from other types of Western nuclear-powered submarines.*

Capabilities for Attack

27. Soviet doctrine indicates that, depending on the situation, enemy SSBNs would be attacked with nuclear or conventional weapons. The tactics and weapons to be used would depend upon the strategic situation—whether the conflict had escalated to the nuclear level or whether a nuclear attack on the Soviet homeland appeared imminent—and the assessment of the validity of the contact. We believe that Soviet weapons would perform reliably against submarine targets once they were localized (see Figure 4).

28. About ten years ago the Soviets considered the concept of bombarding suspected SSBN operating areas with nuclear warheads, but it is unlikely that their knowledge of SSBN locations is sufficiently accurate to make such an approach practicable (see paragraph 20). Moreover, there is no evidence either from Soviet exercises or literature that this tactic is currently under serious consideration.

Uncertainties

29. The preceding sections have described in general terms the present Soviet approach and capabilities to counter Western SSBNs. There are several areas of uncertainty, however, in our assessment of the Soviets' anti-SSBN capability.

The Role of Mine Warfare

30. The Soviet Union has developed a number of antisubmarine mines

In addition to traditional mine applications (such as high-density mine fields off SSBN bases) the Soviets might attempt to restrict or deny SSBN transit routes as well as portions of operating areas by the deployment of mines. We are uncertain of the degree to which the Soviets intend to use such tactics or how effective they would be.

Availability of Forces for Anti-SSBN Operations

31. We are uncertain about the number of Soviet forces that would be assigned to conduct anti-SSBN warfare. Various other missions have competing claims for the assets available to the Soviet Navy. Nearly all ships in the Soviet Navy have some ASW capability. Table 1 shows first- and second-line ASW forces capable of operations beyond local waters. In time of crisis, it is estimated that most of the available first-line forces and some of the second-line forces would be allocated to ASW operations, although not all of these forces would be assigned an anti-SSBN mission. However, even if they used all of their forces with an ASW capability, they would have only a limited ability for anti-SSBN operations.

The Role of Fixed Sensors

32. We have no evidence of deployment of fixed acoustic submarine detection systems in US SSBN operating areas. We know that such systems are deployed in the Barents Sea, and a system may be deployed in the northern Norwegian Sea. The full extent and purpose of these deployments, however, as well as the analytical techniques used in the processing of collected data, are uncertain.

Assessment

33. Over the past decade the Soviets have made steady improvements in their ASW capabilities.

Figure 4

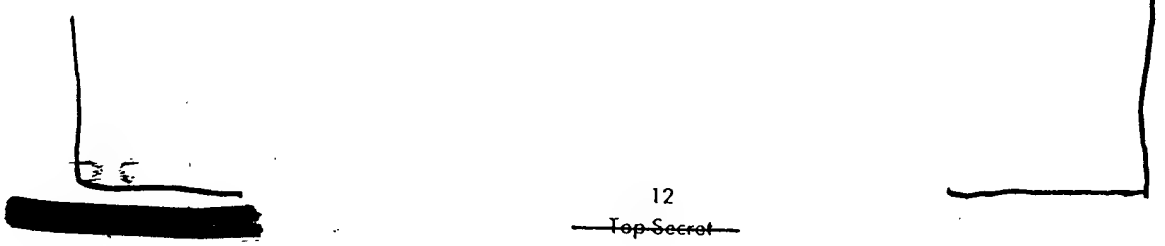


Table 1

First- and Second-line ASW Forces

Class	Soviet Designation	US Designation	OOB (20 March 1976) Western	Pacific	Total
		First-line ASW Forces*			
Moskva	PKR (ASW cruiser)	CHG	2	0	2
Kara	BPK (large ASW ship)	CG	4	0	4
Kresta II	BPK	CG	6	2	8
Kresta I	BPK	CG	3	1	4
Kanin	BPK	DDG	5	2	7
Kashin	BPK	DDG	10	4	14
Mod Kashin	BPK	DDG	5	0	5
Krivak	BPK	DD	10	1	11
Victor I/II	PLA (atomic submarine)	SSN	17	2	19
November	PLA	SSN	9	4	13
Echo	PLA	SSN	0	5	5
Foxtrot	PL (submarine)	SS	41	19	60
Tango	PL	SS	4	0	4
IL-38			30	21	51
TU-142			12	0	12
		Second-line ASW Forces*			
Kynda	RKR (guided missile cruiser)	CG	2	2	4
SAM-Kotlin	EM (destroyer)	DD	6	2	8
Kotlin	EM	DD	8	8	16
Mirka	SKR (escort)	FFL	20	0	20
Petya	SKR	FFL	33	16	49
Riga	SKR	FF	24	11	35
Grisha	MPK (small ASW ship)	PCE	13	4	17
Charlie I/II	PLA (atomic submarine)	SSGN	12	1	13
Echo II	PLA	SSGN	15	14	29
Zulu	PL	SS	9	8	17
Romeo	PL	SS	12	0	12
Whiskey	PL	SS	30	15	45

*The distinction of first- and second-line ASW forces is a US division, not a Soviet one.

Nevertheless, serious deficiencies remain. Because of deficiencies in broad-area ocean surveillance, the Soviets are unable to position their localization and attack forces with sufficient speed or accuracy to threaten a major portion of US SSBNs at sea. Moreover, we believe the Soviets lack the capability to track or trail US SSBNs for extended periods—a capability which, in the absence of a broad-area ocean surveillance capability, are critical to a coordinated strike strategy. We further conclude that under current Soviet strategy for destruction of SSBNs at sea, which contemplates a simultaneous attack against those submarines that had been localized followed by a campaign of attrition, the Soviets could not destroy more than a few SSBNs even under conditions favorable to Soviet ASW forces.

III. FUTURE SOVIET CAPABILITIES TO COUNTER US SSBNs

34. The Soviets are working hard to improve their ASW capability. The extensive Soviet ASW research programs indicate a desire to overcome their present deficiencies in countering the Western SSBN force and would apply to both coordinated strike and attrition strategies. To be able to conduct a coordinated strike against Western SSBNs, the Soviets must develop a capability for long-term tracking or effective broad-area ocean surveillance of SSBN operating areas. Even if the Soviets fall short in both of these capabilities for a coordinated strike, we expect them to improve their capability to deal with SSBNs over an extended period, that is, by attrition.

35. We believe that the Soviets will continue to invest heavily in research, development, and deployment of systems which show promise of improved ASW capability.[4] Some existing ships will probably be modernized and new classes of surface ships, with new or improved ASW hardware, will enter the operational inventory. New classes of nuclear attack submarines with better sensors and quieting probably will be introduced, and we expect new types of ASW aircraft will enter the Soviet inventory later in the decade.

36. The Soviets may use for ASW advanced platforms now under development having characteristics of high speed and performance maneuverability, long range, and endurance. Follow-on ASW weapons, such as improved versions of missile-delivered torpedoes and depth charges, probably are also under development. Improved mines and torpedoes are also expected to appear. New tactics will be developed to exploit the capabilities of these platforms, sensors, and weapons.

Long-Term Trail

37. The Soviets are experimenting with several techniques for tracking SSBNs at sea using acoustic and nonacoustic sensors on surface ships, aircraft, and submarines. They appear to believe that the use of submarines for trailing is a promising means for tracking Western SSBNs. Also, of the several possible techniques for tracking SSBNs, trailing is the only one available to the Soviets which has any prospects for being carried out covertly. (For a discussion of the limitations of wide-area surveillance systems for Soviet application to SSBN tracking, see paragraphs 46-50.)

38. In order for a sizable portion of the Western SSBN force to be threatened, the Soviets would have to trail some submarines for periods as long as several weeks. Trailing is a highly complex operation in which skill and experience can be as important as the sensors and quietness of the trailing platform. During the next decade we believe, however, that technological developments will be the key limiting element in Soviet acquisition of capabilities to trail Western SSBNs.

[4] See Annex for discussion of possible developments in Soviet ASW technology.

Acoustic Trail

39. Using acoustic techniques for trailing, the Soviets would have to make major strides in both radiated submarine noise reduction and acoustic sensor development before they could approach a capability to trail US SSBNs covertly for extended periods.

Although the Soviets have the technology to produce quieter nuclear submarines, we have identified no Soviet program to control radiated noise to reduce counterdetection. US submarines also enjoy a substantial advantage in passive sonar performance as well

41. The Soviets will, nevertheless, almost certainly make improvements in acoustic performance over the next ten years by designing new sonars (possibly including towed arrays) with better signal processing. They will probably also achieve some reduction in radiated submarine noise. Thus the Soviets could launch a submarine during the next ten years that could be on an acoustic par with today's US submarines. They probably could not achieve the required advantage, however, even in the absence of further US improvements in radiated noise. We conclude, therefore, that successful acoustic passive trail over long periods will be beyond Soviet capabilities through the mid-1980s.

42. The Soviets could attempt to maintain trail of SSBNs with active sonars at long ranges and still achieve covertness by disguising the structure of their sonar signals. While there remain several unknowns about this technique, it is judged unlikely that in the next ten years the Soviets could develop a successful

system of this type for covert trailing over long periods.

Nonacoustic Trail

43. There is evidence that the Soviets have employed, periodically over the past three years, a limited number of nonacoustic sensors systems in operations against their own submarines possibly on a trial or experimental basis. Our knowledge of Soviet programs in this area is limited. Therefore we cannot estimate with confidence the potential effectiveness of these systems.

44.

Our judgment, which is presented in the Annex, is that an effective system for long-range nonacoustic trail will not be fully operational during the next ten years.

Overt Trail

45. Expected improvements in sensors, communications, and numbers of ASW-capable units portend an improved capability for overt trail. In view of the counteractions available to the US SSBN force,

overt trail would probably not afford the Soviets a reliable capability for continuous trailing. Moreover, the initiation of overt trailing would alert the US to Soviet intentions long before a sizable number of submarines at sea would be threatened.

Wide-Area Surveillance Systems

46. An effective wide-area surveillance system would not only have to search wide areas of the open ocean, but also need to have a high probability of detection and low probability of false alarm. For use in such a system, airborne platforms offer potential for high search rates because of their high speed. The Soviets, however, would have to develop the required sensors. They are experimenting with radar and IR detection of submarine surface wakes for use in aircraft. An IR detection system would be particularly sensitive to weather conditions, as well as submarine depth and speed; a radar less so. We estimate that the Soviets could possibly deploy an IR system within the

next ten years, but there is much uncertainty on the probability of valid detection that might be achieved with such a system. We are uncertain about the feasibility of airborne radars for submarine detection. In any case, we believe it unlikely that an effective system can be developed and deployed in the next ten years.

47. An ELF electromagnetic fixed detection system could be deployed but, because of the short detection range, it is not expected to enhance appreciably Soviet capabilities to detect SSBNs.

ELF systems are probably limited to ranges of less than 5 nm.

48. The Soviets have a research and development program in magnetometers for magnetic anomaly detection (MAD), and are experimenting with lasers that could have an application to ASW.

These programs are not expected to have a significant impact on wide-area search in the next ten years, because of the short detection ranges of magnetometers and the major advances which would be needed in laser technology to achieve both high search rates and adequate penetration with the sea.

49.

the Soviets could develop high-performance hull-mounted or towed acoustic arrays. Such systems based on current technology would increase somewhat the Soviet general ASW capability, but they would likely present only modest improvements in the Soviets' ability to detect SSBNs in the open ocean. Recent unclassified US research and development in acoustic arrays and signal processing indicates the possibility of relatively long-range acoustic detection by both fixed and towed arrays. While the Soviets could exploit such research and development, it is unlikely that they could have an operational system based on this advanced technology during the next ten years. Development of an effective operational system would require that the Soviets make substantial improvements in present sonar signal processing and in the means for coordination among the various search platforms.

50. Finally, we do not expect the deployment of any spaceborne or fixed submarine detection systems capable of fulfilling the wide-area surveillance requirement during the next ten years.

Limitations of geography and the Soviet technology in underwater cable systems, as well as the quietness of US submarines, rule out deployment of an effective fixed long-range surveillance system such as SOSUS.

Assessment

51. Soviet ASW research and development over the next ten years will almost certainly include continued efforts to achieve the capability to successfully conduct a coordinated strike. The cumulative effect of advances across the broad front of Soviet ASW-related research and development will improve Soviet capabilities. We expect the Soviets to concentrate on trying to overcome present shortcomings in broad area ocean surveillance and in long-term trail capabilities. Our assessment of the prospects for Soviet success in these areas depends heavily on our evaluations of Soviet sensor developments and data handling systems. We have limited knowledge of Soviet progress in certain technical areas in which an effective sensor system might be developed

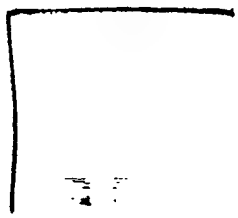
Our assessment of Soviet prospects is tempered by gaps in our knowledge of Soviet progress in certain basic technologies applicable to ASW sensor development.

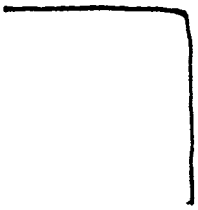
52. From what we do understand about Soviet research and development programs, and about the technological difficulties and operational problems involved in overcoming their deficiencies, we conclude that Soviet efforts have little prospect for achieving an operational capability to conduct a coordinated strike against the entire Western SSBN force during the next

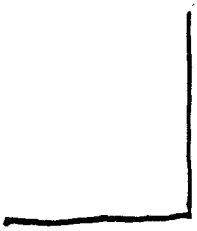
ten years. It is probable that future improvements in Soviet defense will place Western SSBN in greater risk of detection and destruction in restricted waters and possibly in some of their current operating areas. However, in that period, the improvements we foresee as likely would give them the capability to destroy only a few SSBNs at sea. Thus, we estimate that improvements in Soviet ASW capabilities over the next ten years will fall short of preventing most US submarines on station from launching their missiles.

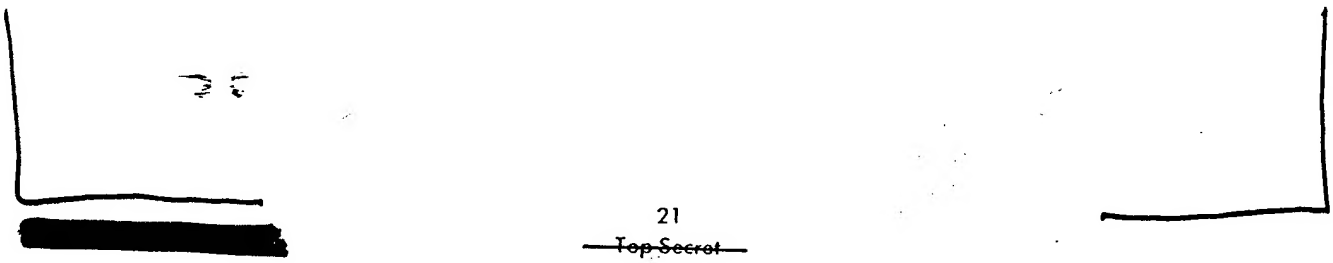
ANNEX

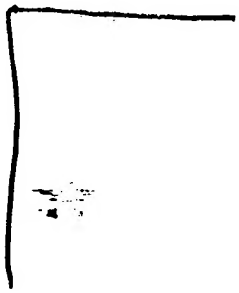
SOVIET ASW TECHNOLOGY

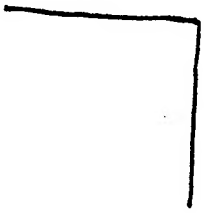


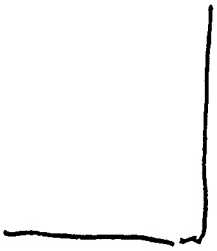


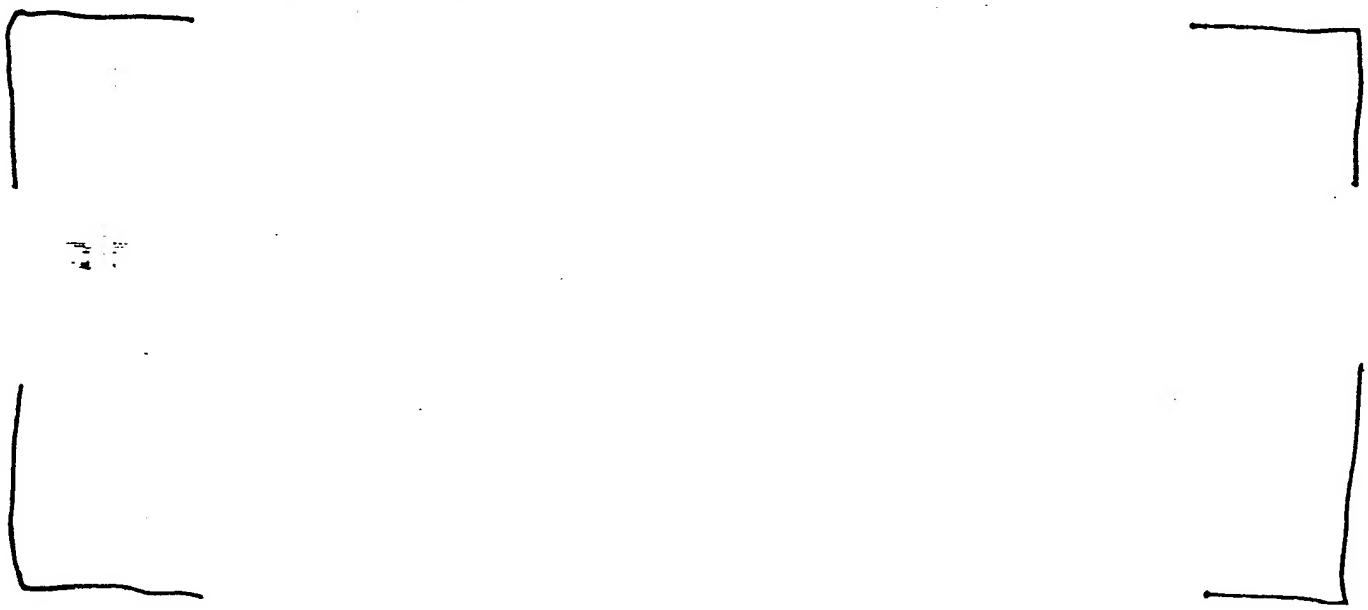












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